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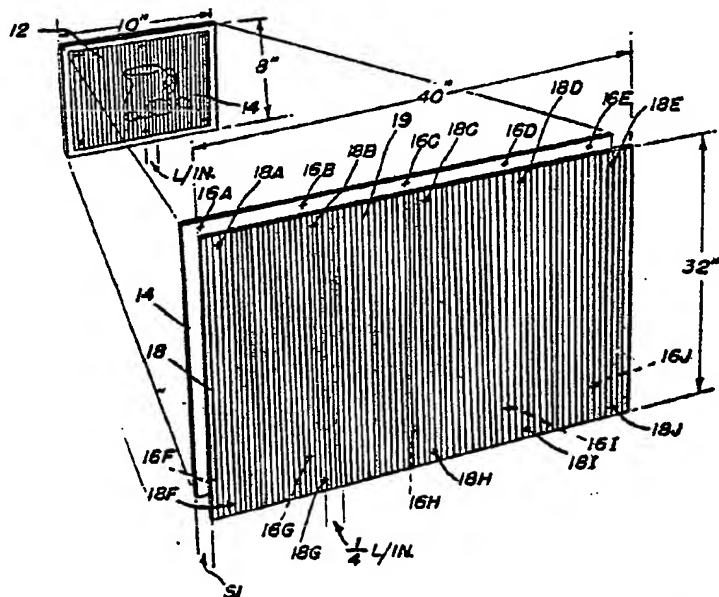
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(54) Title: METHOD AND APPARATUS FOR DISPLAYING A THREE DIMENSIONAL VISUAL IMAGE

(57) Abstract

A photographic display for depicting a three dimensional visual image including a supporting frame (44) for displaying a photographic image including a height, width and a predetermined thickness. A viewing screen (18) is provided and disposed to extend substantially along the height and width of said supporting frame and being positioned on a first side thereof. The viewing screen includes a plurality of substantially parallel lines (19) having a predetermined width and being separated by clear spaces. A photographic image (14) is provided and disposed to extend substantially along the height and width of said supporting frame and being positioned on a second side thereof, spaced from said first side by said predetermined thickness of the supporting frame. The photographic image includes a plurality of substantially parallel image segments having a predetermined width corresponding to the width of the lines positioned on the viewing screen and the lines (12) positioned on the photograph image are in alignment and registration with the lines positioned on the viewing screen. The predetermined thickness spacing the photographic image from the viewing screen reveals a three dimensional visual image of the photographic image when viewing the photographic image through the viewing screen. Ambient air is positioned in the space between the viewing screen (18) and the photographic image (14).



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METHOD AND APPARATUS FOR DISPLAYING
A THREE DIMENSIONAL VISUAL IMAGE

DESCRIPTION

Technical Field

5 The present invention is directed to a method and apparatus for displaying a three dimensional visual image.

Background Art

10 It is customary in displaying an advertisement to depict the advertisement in a two dimensional light frame box. The two dimensional picture displays advertising indicia to entice a potential customer into purchasing a particular product.

15 Displaying a three dimensional photograph has been extremely difficult. The ability to mass produce a three dimensional photographic image for displaying in a lighted box has hithertofore been impractical. The present invention overcomes deficiencies in the prior art by permitting the display of a three dimensional
20 photographic image for enticing a consumer to purchase a particular product.

Disclosure of Invention

25 It is an object of the present invention to provide a photographic display for depicting a three dimensional visual image.

 A further object of the present invention is to provide a photographic display which may be constructed of either a flexible material, a semirigid material or a rigid material.

30 A still further object of the present invention is to provide a photographic display which may be enlarged for displaying a three dimensional image.

 Another object of the present invention is to maintain a viewing screen in a substantially parallel
35 relationship with respect to a photographic image so as to display a three dimensional visual image.

A further object of the present invention is to eliminate the need for heavy, bulky, costly glass or plastic lenticular viewing screen configurations which have hitherto been necessary.

5 A still further object of the present invention is to provide a multidimensional photographic display which may be reproduced by photographically reproducing a Kodak Duratrans enlarged photograph which is used as the photographic image in the three dimensional display.

10 Another object of the present invention is to provide a photographic display which is capable of being reproduced by a printing plate using a clear polycarbonate film or other clear film compatible with proper inks whereby a lithograph of the exact image is positioned thereon.

15 A still further object of the present invention is to provide a photographic display which may be reproduced by utilizing a silk screen or by utilizing a drum roller shaped plate to position a linear pattern on any suitable clear material for displaying the three dimensional visual image.

20 These and other objects of the present invention are achieved by providing a supporting frame for displaying a multidimensional photographic image which includes a height, width and a predetermined thickness. A viewing screen is positioned on one side of the supporting frame and extends substantially along the height and width thereof. The viewing screen includes a plurality of substantially parallel lines having a predetermined thickness and being separated by clear spaces. A photographic image is positioned to extend along the height and width of the supporting frame and is disposed on a second surface thereof. The viewing screen is spaced from the photographic image by the predetermined thickness of the supporting frame. The photographic image includes a plurality of substantially parallel image segments having a predetermined thickness

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corresponding to the thickness of the lines positioned on the viewing screen and being in alignment and registration with the lines positioned on the viewing screen. The predetermined thickness of the supporting frame spaces the viewing screen from the photographic image to reveal a three dimensional visual image of the photographic image when viewing the photographic image through the viewing screen.

Further objects of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Brief Description of Drawings

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Figure 1 is a perspective view illustrating a photographic image being enlarged to a predetermined extent with a viewing screen spaced a predetermined distance from the photographic image;

Figure 2 is a perspective view illustrating an arrangement of the viewing screen relative to the photographic image to maintain the viewing screen and the photographic image in a substantially parallel and registered arrangement;

Figure 3 is an enlarged view of a section of the present invention as illustrated in Figure 2;

Figure 4 is a partially cutaway view illustrating the viewing screen and the photographic image being disengaged from a rigid support frame;

5 Figure 5 is an exploded view illustrating another embodiment of the present invention wherein the viewing screen and the photographic image are positioned on a support frame;

10 Figure 6 is an embodiment of the present invention wherein the viewing screen and the photographic image are positioned on rigid material and disposed on each side of a support frame;

15 Figure 7 is a perspective view illustrating two rigid photographic images positioned relative to viewing screens which may be combined adjacent to each other so as to depict a billboard; and

Figure 8 is a perspective view illustrating the display device set forth in Figure 2 being combined in a side-by-side arrangement to project the image of a billboard.

20 Modes For Carrying Out the Invention

As illustrated in Figures 1-3, the present invention begins with a photograph which may be in the size of 4 inches by 5 inches, 5 inches by 7 inches, 8 inches by 10 inches, 11 inches by 14 inches or any other size of
25 existing large film format. The photograph is positioned on a flexible film and is produced by any one of a number of still cameras capable of applying a series of substantially parallel image segments onto the surface of the photograph by way of a lenticular line screen. The
30 series of substantially parallel image segments 12 positioned on the photograph 14 are arranged to have a predetermined width based on the lenticular line screen used in the type cameras aforementioned. A certain
35 number of lines per linear inch are originally set forth on the film which may be 8 inches by 10 inches, as illustrated in Figure 1.

The photographic image 14 may be enlarged to any desired size. As illustrated in Figure 1, a 400 percent enlargement renders an 8 inch by 10 inch photograph into a photograph which is 32 inches by 40 inches. The number
5 of substantially parallel lines 12 appearing in the original photographic image 14 is decreased so that one-fourth of the number of lines are set forth in the enlarged print per linear inch. Registration marks 16A-16J are transposed to appear on the enlarged
10 photographic image. A viewing screen 18 is made of a clear material having a plurality of substantially parallel lines 19 being disposed thereon. The substantially parallel lines 19 are separated by clear spaces along the length of the viewing screen. The lines
15 19 and the lines 12 are the same thickness and are spaced apart by the same distance. The viewing screen 18 includes a plurality of registration marks 18A-18J disposed on the surface thereof.

As illustrated in Figures 1-3, the viewing screen 18
20 must be aligned and in proper registration with the photographic image 14. The plurality of substantially parallel lines 19 positioned on the viewing screen 18 must be aligned and in proper registration with the substantially parallel image segments 12 appearing on the
25 photographic image 14. In addition, the viewing screen 18 must be in a substantially parallel relationship with the photographic image 14.

To position the viewing screen 18 to be substantially parallel with the photographic image 14 and
30 to be properly spaced a predetermined distance therebetween, a first supporting frame structure is set forth in Figures 2 and 3. A spacer 22 is provided to extend between the viewing screen 18 and the photographic image 14. A bolt 28 is positioned to be received between
35 washers 23-26 and is secured by means of a nut 29. The spacer 22 is positioned around the bolt 28 and serves to define the specific distance necessary between the

viewing screen 18 and the photographic image 14. A spring 32 is utilized to secure the viewing screen 18 and the photographic image 14 to a peg 42 positioned on an outer frame 44. A plurality of pegs are disposed around the outer frame 44 and are engaged by a plurality of springs to stretch the flexible viewing screen 18 and the photographic image 14 so as to be in a substantially taut position and to ensure a substantially parallel relationship between the viewing screen 18 and the photographic image 14. Only ambient air is positioned in the space between the viewing screen and the photographic image.

The registration marks 16A-16J positioned on the photographic image 14 are utilized to align the viewing screen 18 by positioning the registration marks 18A-18J to be aligned relative therewith. In this manner, the plurality of substantially parallel lines appearing on the viewing screen 18 are adequately aligned and in registration with the plurality of substantially parallel lines 12 appearing on the photographic image 14.

The space 51 positioned between the viewing screen 18 and the photographic image 14 is determined mathematically. The thickness of the taking screen lens in the camera which includes a series of substantially parallel lenticular lines is one variable in the formula for determining the spacing between the viewing screen 18 and the photographic image 14. The second variable is the enlargement ratio between the original photographic image depicted on a photographic film and the enlarged photographic image depicted on the enlarged sheet. For example, the embodiment illustrated in Figure 1 is a 400 percent enlargement which would be an enlargement ratio of 1:4. The enlargement ration 1:4 is multiplied times the thickness of the original lenticular taking screen of the camera. Thus, the spacing 51 is determined by multiplying the number four (4) times the thickness of the original taking screen.

The original lenticular taking screen in a camera which is utilized to print a film negative by exposing the lenticular screen onto a light sensitive, ortho type (Kodalith) film is extremely important in depicting a three dimensional image. A series of substantially parallel lines which are separated by clear spaces are depicted onto the photographic image disposed on the film. As previously discussed, initially the number of lines 12 disposed along a linear inch of the photographic image will be a certain value. The three factors, namely, the lines 12, the clear spaces between the lines 12 and the thickness of the original taking screen must remain constant throughout the enlarging process to depict a successful three dimensional image. By maintaining the variables in a constant relationship, the enlarged image may be perceived as a three dimensional image. Thus, the space 51 must be maintained as being equal to the enlargement ratio multiplied times the thickness of the original taking screen to result in a perception of a three dimensional image.

The viewing screen 18 and the photographic image 14 must also be arranged in a substantially parallel relationship in order to trick a viewer's eye into seeing a multidimensional image in the enlarged size. The enlarged linear pattern of substantially parallel lines 19 must line up substantially parallel with the image segments 12 of the enlarged photo 14 to display a multidimensional image.

Figure 4 illustrates another embodiment of the present invention wherein the photographic image 64 is positioned on a semirigid material. The viewing screen 68 is also constructed of a semirigid material. The photographic image 64 and the viewing screen 68 are positioned within slots 72, 82 disposed within the outer frame 84. The outer frame 84 is a rigid support frame having the slots 72, 82 disposed around and spaced a predetermined distance with respect to each other within

the inner peripheral surface of the outer frame 84. The photographic image 64 is thereby spaced the required predetermined distance from the viewing screen 68 so as to display a three dimensional visual image. The distance between the slots 72, 82 is determined in the same manner as the distance 51 is determined with respect to the embodiment illustrated in Figures 1-3.

Figure 5 shows another embodiment of the present invention wherein the photographic image 94 and the viewing screen 98 are positioned on a support frame 104. The support frame 104 includes a tension applying spacer 105 including a plurality of pegs 102 disposed along the length thereof. In addition, pegs 107 are disposed along the upper surface of the outer frame 104. A plurality of springs 142 connect the spacer 105 to the outer frame 104. In addition, a fixed supporting frame 110 is mounted to the lower end of the outer frame 104. The fixed support frame 110 includes a plurality of pegs 112 disposed along the length thereof.

The viewing screen 98 includes a plurality of apertures 114 positioned along the length dimension thereof. The apertures 114 are designed to mate with the pegs 102, 112 to secure the viewing screen 98 to the outer frame 104. The springs 142 apply tension to the viewing screen 98 to hold the viewing screen in a fixed orientation relative to the outer frame 104.

An additional spacing bar 130 includes a plurality of apertures 130A-130E disposed along the length thereof. In addition, a spacer bar 132 is provided with a plurality of apertures 132A-132E disposed along the length thereof. The spacer bars 130, 132 are designed to be positioned on the pegs 102, 112 of the frame members 105, 110, respectively. The photographic image 94 includes a plurality of slots 115 disposed along the length thereof which mate with the pegs 102, 112. In this manner, the photographic image 94 may be retained in

a tensioned and secure manner relative to the outer frame 104.

Figure 6 illustrates an embodiment of the present invention wherein the photographic image 214 is mounted
5 on a rigid, clear sheet 216. A laminated material 217 may be positioned over the photographic image 214. In addition, the viewing screen 218 is positioned on a rigid, clear sheet 219. A laminated layer 220 may be positioned over the photographic image 218. A frame
10 member 244 is positioned between the sheets 216 and 219. The frame member 244 is of a predetermined thickness for spacing the viewing screen 218 a predetermined distance away from the photographic image 214. The plurality of substantially parallel lines disposed on the viewing
15 screen 218 must be in proper alignment and registration with the plurality of substantially parallel lines disposed on the photographic image 214.

Figure 7 is a perspective view illustrating two photographic units 310, 320 being positioned relative to
20 each other. A support and alignment member 315 secures the lower edge of the photographic units. A mullion 318 is utilized to secure the height dimension of the photographic units. The photographic units 310, 320 may be constructed in the same manner as the photographic
25 unit illustrated in Figure 6. By positioning a plurality of photographic units 310, 320 in alignment with respect to each other, an enlarged image may be displayed which depicts a three dimensional visual image. In this manner, a billboard size three dimensional visual image
30 may be depicted.

Figure 8 illustrates an embodiment of the present invention wherein a plurality of the flexible viewing
screens 18 and the photographic images 14 may be positioned in a side-by-side arrangement. A plurality of
35 flexible photographic units 410, 411, 412 and 413 are arranged in a side-by-side manner. A plurality of spacers are utilized to space the viewing screen 418 from

the photographic image 414. In addition, a plurality of springs 420 are provided for mounting the units 410, 413 onto an enlarged outer frame, not illustrated, to retain the viewing screen 418 in a substantially parallel relationship with respect to the photographic image 414.

According to the present invention, a taking screen in a camera may include a lenticular screen which is used as a master in the optical slide making technique. This technique includes a series of registration markings on the taking screen. The same camera containing the taking screen may be utilized to photograph the image which is desired to be viewed in a three dimensional manner. In addition, the same camera with the same taking screen may be used to make a film having a plurality of substantially parallel lines and clear spaces positioned thereon which is utilized in making the viewing screen. Thus, any original photograph which is enlarged in the exact mathematical ratio with the film forming the taking screen will have the exact registration markings positioned on both the enlarged photographic image and on the enlarged taking screen. The registration markings assist in properly aligning the plurality of substantially parallel lines disposed on both the viewing screen and on the photographic image.

There are a number of various ways in which to enlarge both the photographic image and the viewing screen. More specifically, the photographic image and the viewing screen may be enlarged photographically by reproducing a Kodalith or enlarged format image. This enlarged photographic image and Kodalith viewing screen may be positioned in a side-by-side relationship so as to depict a three dimensional image. In addition, a printing plate may be utilized to reproduce the plurality of substantially parallel lines on a clear polycarbonate film or other compatible clear film utilizing proper inks. A lithographic technique may be incorporated to reproduce the exact image in any desired quantity. This

technique can be done with construction of sufficient strength and durability to directly withstand outdoor weather conditions.

5 A third technique utilized to enlarge the viewing screen may incorporate a silk-screening procedure. The fabric on which the enlargement is to be positioned is stretched with the grain running at an acute angle with respect to the linear pattern of substantially parallel lines which are desired to be positioned on the enlarged
10 photographic image and the enlarged viewing screen. This technique avoids a moire pattern which will have a negative effect on the reproduced image. The desired number of reproductions may be thereafter reproduced by utilizing the same silk screen technique. A fourth
15 procedure in which to enlarge the viewing screen may incorporate a drum roller shaped plate with the linear pattern of substantially parallel lines being disposed thereon. The lines are applied in the exact mathematical ratio and printed in a continuous pattern on any suitable
20 clear material utilizing compatible inks.

The original photographic image may be enlarged onto a transparency film with a built-in diffuser (such as Kodak's Duratrans). This technique utilizing a transparency with a built-in diffuser can eliminate
25 heavy, costly and light reducing materials. In addition, offset printing may be incorporated into the enlargement process wherein both sides of the plastic diffuser material will include printing thereon. More specifically, a standard lithographic color separation is
30 made into two sets, one right reading and the second, wrong reading. The right reading print is positioned on a first side of the plastic material. The wrong reading print is positioned on a second side of the plastic material in tight registration. In this manner, both
35 sides of the plastic material are impinged with the same image. Sufficient color saturation can be achieved in

this manner to give the illusion of a photographic reproduction while utilizing offset printing.

All of the enlarged format three dimensional transparency configurations discussed hereinabove are
5 designed to be incorporated into a rear illuminated viewing box. Typical incandescent, fluorescent or other light fixtures are positioned within the viewing box. The photographic image and the viewing screen are positioned to have the light project through the rear of
10 the image. A certain portion of the light is blocked by the linear pattern of substantially parallel lines which are printed on both the photographic image and on the viewing screen. It is desirable to increase the total lighting output of the viewing box by 50 to 100 percent
15 for sufficient and even illumination.

By utilizing modern materials and mounting techniques, the displaying device of the present invention can maintain flatness, spacing and alignment while permitting the display to be positioned outdoors.
20 Positioning the display device outdoors is desirable to increase the marketability of the present invention.

The semirigid embodiment of the present invention may be laminated on both sides with a film applied under heat and pressure to completely and permanently seal the
25 photographic image and the viewing screen in a semirigid sandwich. This film which is permanently sealed may be displayed in the manner illustrated in Figures 4, 5, 6 or 7. This semirigid construction incorporates a stiffness to the various substrates thereby maintaining a
30 weather-tight unit which is easily handled, is interchangeable, is in proper registration and provides an inexpensive system.

The technique illustrated in Figures 2 and 5 provides a viewing screen and a photographic image which
35 are floating under the same tension and conditions. In this manner, the viewing screen and the photographic image will remain substantially vertical and in a

substantially parallel relationship with respect to each other. Both the viewing screen and the photographic image will not be affected by irregularities in the support frame and the surfaces of the support frame, by heat whether it be expansion or contraction, or by moisture conditions. This technique should be contrasted with the rigid mounting technique illustrated in Figure 6 wherein the viewing screen and the photographic image are positioned on a thicker base material to add extra rigidity to the unit.

By segmenting the original photograph and yet maintaining the same mathematical ratio and registration, it is possible to provide a billboard size three dimensional image as illustrated in Figures 7 and 8. The viewing screen and the photographic image may be properly laminated so as to provide a weatherproof unit. The billboard size three dimensional display illustrated in Figure 7 requires mullions 318 to secure the units together. The billboard size display illustrated in Figure 8 can incorporate invisible splicing of the modules by utilizing a clear dry mount material and clear splicer film, for example, mylar, vinyl, acetate, etc.

The method of the present invention is achieved by utilizing a camera having a lenticular taking screen of predetermined thickness. A photographic image is printed having the series of substantially parallel image segments being superimposed thereon. A film is printed which includes the plurality of parallel lines disposed thereon. The film will comprise the viewing screen in the three dimensional display. The film and the photographic image are spaced a predetermined distance therebetween. The substantially parallel lines on the film and the substantially parallel image segments on the photographic image are aligned with respect to each other. The film is maintained in a substantially parallel orientation with respect to the photographic image, thus displaying a three dimensional visual image.

In this method, the same camera is utilized to produce both the film having the plurality of substantially parallel lines disposed thereon and the photographic image having the plurality of parallel image segments disposed thereon. The predetermined distance between the film and the photographic image is determined by the enlargement ratio times the thickness of the camera taking screen.

The present invention provides a multidimensional photographic display wherein the laminating of the elements are easily waterproofed for utilizing the display for outdoor advertising.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

20 Industrial Applicability

The way in which the present invention is capable of exploitation in industry and the way in which it can be made and used is deemed to be obvious from the description or nature of the invention.

25 However, by way of further explanation of the way in which the present invention is capable of exploitation in industry, the present invention can be embodied in visual displays used in advertising.

THE CLAIMS

We claim:

1. A photographic display for depicting a three dimensional visual image comprising:

5 supporting frame means for displaying a photographic image including a height, width and a predetermined thickness;

a viewing screen disposed to extend substantially along the height and width of said supporting frame means and being positioned on a first side thereof;

10 said viewing screen including a plurality of substantially parallel lines having a predetermined width and being separated by clear spaces;

a photographic image disposed to extend substantially along the height and width of said supporting frame means and being positioned on a second side thereof, spaced from said first side by said predetermined thickness of said supporting frame means;

15 said photographic image including a plurality of substantially parallel image segments having a predetermined width corresponding to the width of said lines positioned on said viewing screen and said lines positioned on said photographic image being in alignment and registration with the lines positioned on said viewing screen;

20 wherein said predetermined thickness spacing said photographic image from said viewing screen reveals a three dimensional visual image of said photographic image when viewing said photographic image through said viewing screen.

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2. A photographic display according to claim 1, wherein the supporting frame means includes an outer frame, a plurality of spacers and a plurality of spring

members for securing the viewing screen and the photographic image to the outer frame.

3. A photographic display according to claim 1, wherein the supporting frame means includes a rigid support frame with two slots disposed therein for retaining the viewing screen and the photographic image in a substantially parallel arrangement.

4. A photographic display according to claim 2, wherein said viewing screen and said photographic image are flexible and are held in a substantially parallel arrangement by said plurality of spacers and spring members.

5. A photographic display according to claim 3, wherein said viewing screen and said photographic image are semirigid.

6. A photographic display according to claim 1, wherein the photographic image and the viewing screen may be enlarged and the predetermined thickness of said supporting frame is selected as being equal to the enlargement ratio multiplied times the thickness of an original taking screen utilized to photograph the photographic image and the view screen.

7. A photographic display according to claim 2, wherein said outer frame includes a plurality of pegs projecting therefrom for retaining said plurality of spring members under tension for maintaining said viewing frame and said photographic image retained relative to each other by said plurality of spacers in a substantially parallel arrangement.

8. A photographic display according to claim 1, wherein said supporting frame means is a rigid frame.

9. A photographic display according to claim 8, wherein said viewing screen and said photographic image are rigid members.

10. A photographic display according to claim 1,
5 wherein said supporting frame means includes a rigid outer frame, at least two spacers positioned between said viewing screen and said photographic image and a plurality of spring members for securing said spacers to said rigid outer frame while maintaining said viewing
10 screen and said photographic image in a substantially parallel arrangement.

11. A method of displaying a three dimensional visual image comprising the following steps:

15 printing a film with a series of substantially parallel lines having a predetermined thickness which are separated by clear lines;

printing a photographic image having a series of substantially parallel lines being superimposed thereon;

20 spacing the film from the photographic image by a predetermined distance;

aligning the substantially parallel lines on said film with the substantially parallel lines on said photographic image;

25 maintaining the film in a substantially parallel orientation with respect to said photographic image for displaying a three dimensional visual image.

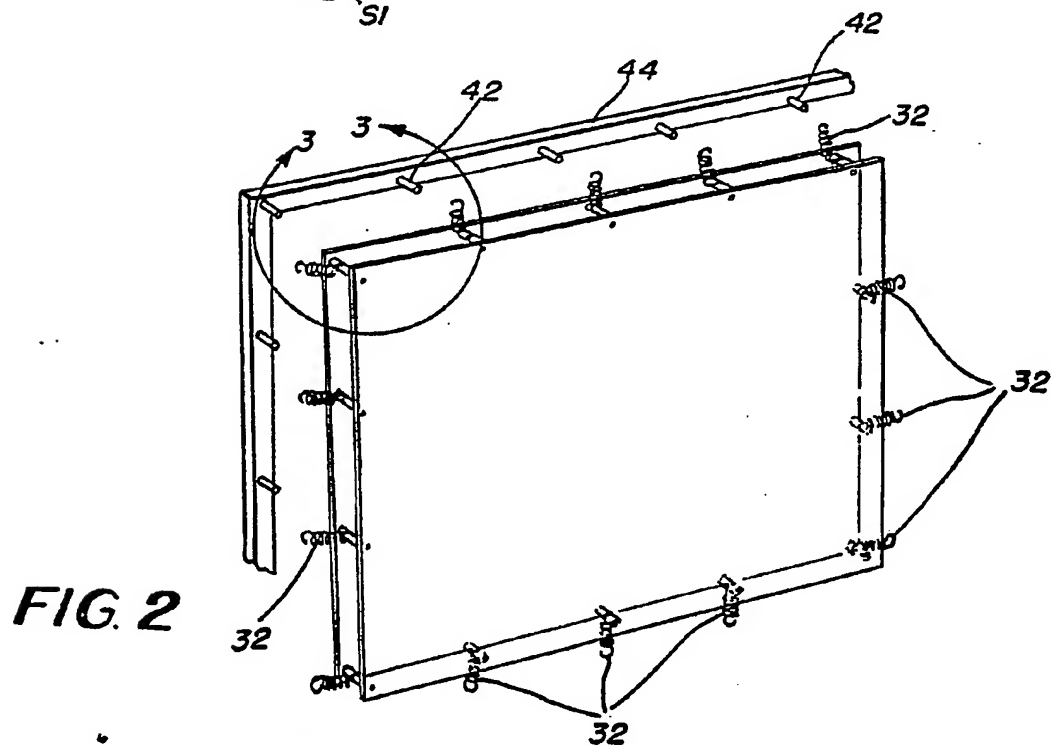
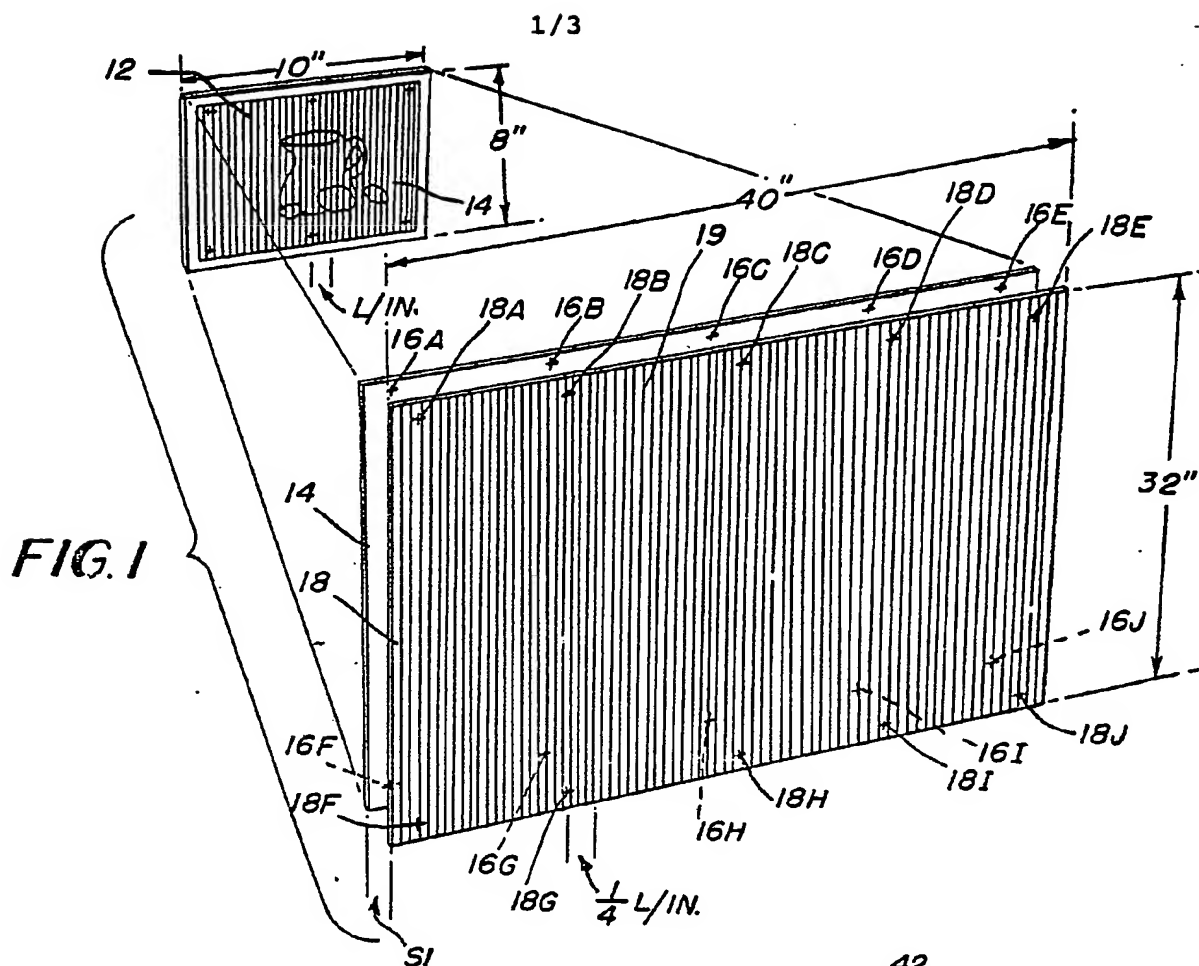
12. A method according to claim 11, wherein a camera taking screen having a predetermined thickness and a series of lines disposed thereon is utilized for
30 printing said film.

13. A method according to claim 11, wherein a camera taking screen having a predetermined thickness and

a series of lines disposed thereon is utilized for printing said photographic image.

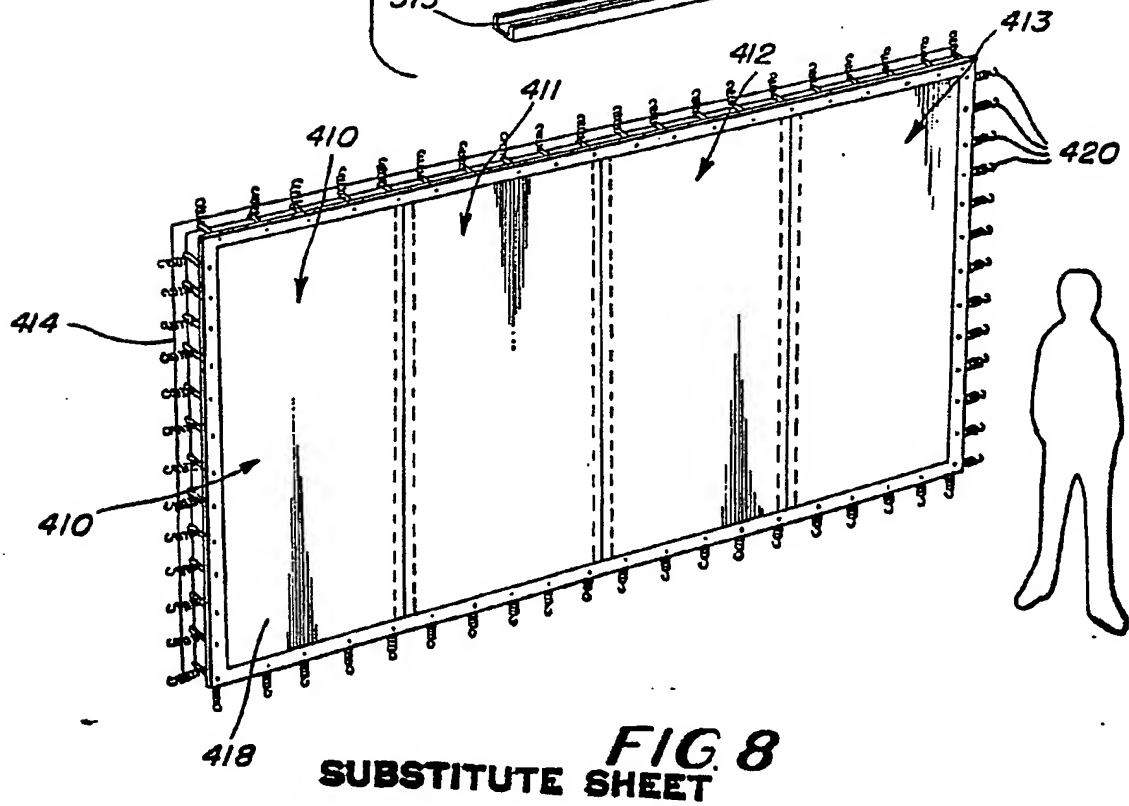
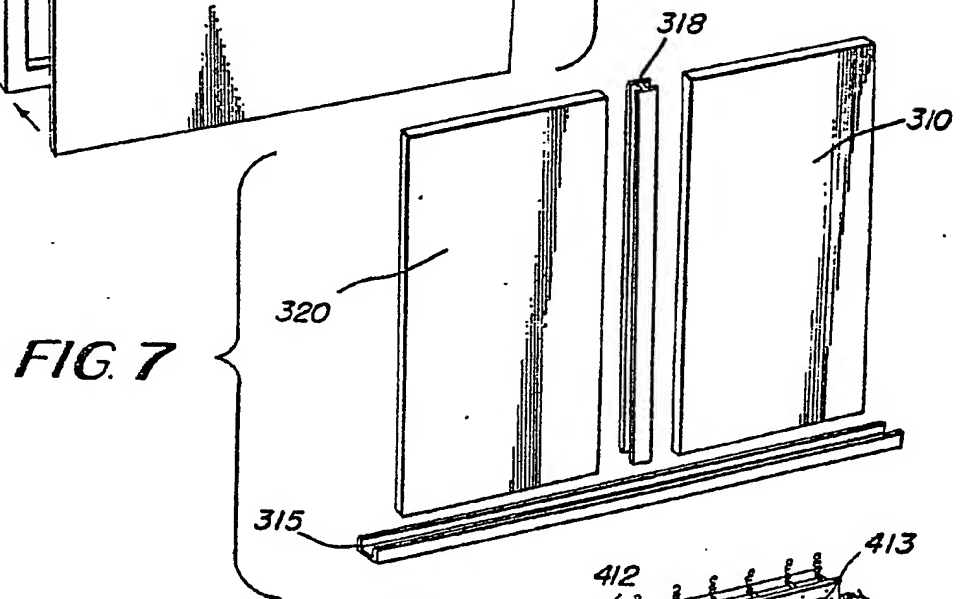
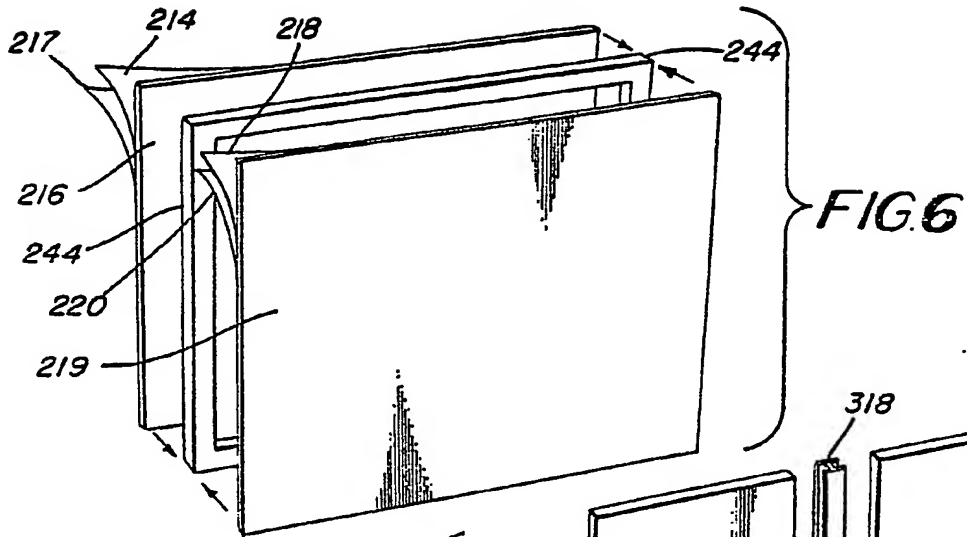
14. A method according to claim 12, and further including enlarging said film and said photographic image by a predetermined ratio and selecting said spacing between said film and said photographic image to be equal to the enlargement ratio times the thickness of the camera taking screen.

15. A method according to claim 13, and further including enlarging said film and said photographic image by a predetermined ratio and selecting said spacing between said film and said photographic image to be equal to the enlargement ratio times the thickness of the camera taking screen.



SUBSTITUTE SHEET

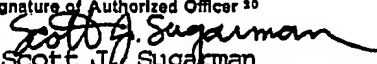
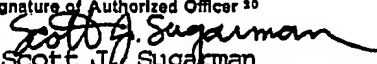
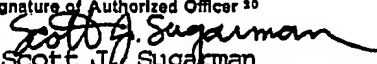
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INTERNATIONAL SEARCH REPORT

PCT/US86/00503

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ¹ According to International Patent Classification (IPC) or to both National Classification and IPC Int. CL. ⁴ G02 B 27/22; G03 B 21/00 U.S. CL. 350/130, 133, 144; 353/7, 10																				
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Minimum Documentation Searched ⁴</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%; border-bottom: 1px solid black;">Classification System</th> <th style="width: 70%; border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="vertical-align: top; padding: 5px;">U.S.</td> <td style="vertical-align: top; padding: 5px;">350/130, 133, 144 352/86 353/7, 10</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched ⁵</div>			Classification System	Classification Symbols	U.S.	350/130, 133, 144 352/86 353/7, 10														
Classification System	Classification Symbols																			
U.S.	350/130, 133, 144 352/86 353/7, 10																			
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; padding: 5px;">Category ⁶</th> <th style="width: 60%; padding: 5px;">Citation of Document, ¹⁵ with indication, where appropriate, of the relevant passages ¹⁷</th> <th style="width: 30%; padding: 5px;">Relevant to Claim No. ¹⁸</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 4,158,481 (Hoyer) 19 June 1979 See col. 5, line 31-col. 6, line 27.</td> <td style="vertical-align: top; padding: 5px;">1, 8, 9, 11-13</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 3,101,644 (Lopez-Henriquez) 27 August 1963 See col. 5, line 45-col. 6, line 7.</td> <td style="vertical-align: top; padding: 5px;">1-15</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 2,679,188 (Gould) 25 May 1954 See col. 2, line 51-col. 3, line 40.</td> <td style="vertical-align: top; padding: 5px;">1, 8, 9, 11-13</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 2,184,641 (Glanz) 26 December 1939 See col. 3, lines 40-71.</td> <td style="vertical-align: top; padding: 5px;">1, 8, 9, 11-13</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 1,882, 424, (Ives) 11 October 1932, See page 3, line 36-page 4, line 4.</td> <td style="vertical-align: top; padding: 5px;">1, 8, 9 11-13</td> </tr> </tbody> </table>			Category ⁶	Citation of Document, ¹⁵ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸	X	US, A, 4,158,481 (Hoyer) 19 June 1979 See col. 5, line 31-col. 6, line 27.	1, 8, 9, 11-13	A	US, A, 3,101,644 (Lopez-Henriquez) 27 August 1963 See col. 5, line 45-col. 6, line 7.	1-15	X	US, A, 2,679,188 (Gould) 25 May 1954 See col. 2, line 51-col. 3, line 40.	1, 8, 9, 11-13	X	US, A, 2,184,641 (Glanz) 26 December 1939 See col. 3, lines 40-71.	1, 8, 9, 11-13	X	US, A, 1,882, 424, (Ives) 11 October 1932, See page 3, line 36-page 4, line 4.	1, 8, 9 11-13
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁶ Special categories of cited documents: ¹⁶</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>																				
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of the Actual Completion of the International Search ¹</td> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of Mailing of this International Search Report ²</td> </tr> <tr> <td style="text-align: center; padding: 5px;">17 June 1986</td> <td style="text-align: center; padding: 5px;">09 JUL 1986</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 5px;">International Searching Authority ³</td> <td style="border-bottom: 1px solid black; padding: 5px;">Signature of Authorized Officer ¹⁰</td> </tr> <tr> <td style="text-align: center; padding: 5px;">ISA/US</td> <td style="text-align: center; padding: 5px;">  Scott J. Sugarman </td> </tr> </table>			Date of the Actual Completion of the International Search ¹	Date of Mailing of this International Search Report ²	17 June 1986	09 JUL 1986	International Searching Authority ³	Signature of Authorized Officer ¹⁰	ISA/US	 Scott J. Sugarman										
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